City of Boston
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GREEN INFORMATION TECHNOLOGY ROADMAP

On July 3, 2008, Mayor Thomas M. Menino issued an Executive Order Relative to Greening City Building Maintenance and Operations. Among other directives, the Mayor ordered that this Green Information Technology Roadmap document be issued, and that all City departments adhere to these guidelines.

Information technology—hardware (servers, computers, monitors, printers, and so on) and software (computer applications)—is an essential component of municipal infrastructure, allowing City employees to more efficiently and effectively fulfill their responsibilities in education, housing, public health, security and safety, and the many other areas. Information technology (IT) is also a significant consumer of energy and supplies, and can become a major source of waste, which in some cases is hazardous.

The purpose of the Green Information Technology Roadmap is to present guidelines for the procurement, utilization, and renewal of information technology that will, as required by the Mayor's Executive Order, "further reduce municipal consumption of energy, paper and other resources, and reduce the amount of electronic components entering into our waste stream, and support other City departments' efficiency efforts."

TECHNOLOGY PLANNING AND RENEWAL

Desktop computers and other IT devices, including network equipment, are necessary work tools. To minimize the impact that newly acquired or replaced IT devices have on the environment, Management Information Services (MIS) strives to build a sustainable IT infrastructure. To achieve that goal, MIS works with the Purchasing Department to apply new procurement standards and set forth ways to consolidate, renew, and replace existing technologies. This roadmap describes some of these endeavors.

Procurement

MIS and the Purchasing Department work together to help other City departments replace and renew existing equipment, as well as identify and obtain new technologies that meet the City's operational and financial requirements. Like all City purchases, the procurement of information technology must conform to the Environmentally Preferable Procurement (EPP) Guidelines issued by the Purchasing Department. The goal of EPP is to make procurement decisions that:

- Reduce waste by optimizing product efficiency and effectiveness;
- Conserve natural resources such as energy and water;
- Minimize environmental impacts from pollution, including greenhouse gases;
- Eliminate or reduce toxics that create hazards to employees and the community;

- Reduce the amount of materials put into landfills;
- Support recycling markets;
- Encourage manufacturers and vendors to reduce environmental impacts in their production and distribution systems;
- Create a model that encourages other purchasers to adopt EPP.

Departments considering the procurement and renewal of IT equipment should review the EPP Guidelines upon which the Green IT Roadmap is built.

Energy Efficiency
All electronic equipment purchased should be among the most energy-efficient available. Energy efficiency includes not only the amount of power required for operation, but also, for example, the ability to quickly go into and come out of standby mode or powered-off status.

The Energy Star program (http://www.energystar.gov) is a partnership between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). An Energy Star label indicates that a product meets the program's product-specific energy-efficiency specifications. For product categories without Energy Star specifications, the Federal Energy Management Program (FEMP, http://www1.eere.energy.gov/femp) designates products in the top 25 percent of all similar products when ranked by energy efficiency. Energy Star and FEMP products generally offer reduced energy costs without compromising quality or performance, significant return on investment, extended product life, and decreased maintenance. Wherever applicable, City of Boston purchases should carry Energy Star or FEMP designations. Where there are no FEMP or Energy Star standards, departments should consider the purchase of products that conserve electrical power to the maximum extent possible.

Computers and Monitors
EPEAT (http://epeat.net) is a program of the Green Electronics Council to assess the environmental impacts associated with the manufacture, use, and disposal of computers and monitors. EPEAT criteria address energy conservation (incorporating Energy Star standards), environmentally sensitive materials, recycled content, end-of-life design, packaging, and more. City of Boston purchases should be at the EPEAT Silver level or higher.

When CRT computer monitors reach the end of their life, they are to be replaced with LCD monitors, which reduce power consumption. MIS is available to work with departments in planning and selecting the appropriate replacement monitors.

Printers, Copiers, Scanners, and Fax Machines
Departments considering the purchase of a printer or copier should ask MIS to conduct a needs assessment. The assessment will consider the number of users, load, and other devices that may be reallocated or redeployed.

All new printers and copiers must be selected from a standardized list compiled by MIS. In general, devices on the list will:

- Print and copy double-sided;
- Use toner from recycled cartridges;
- Be multifunctional devices, that is, they will be combined printers/scanners/copiers.

MIS intends to reduce the number of small, individual printers, and has acquired Scalable Survey, an application for asset discovery and inventory, to assist in identifying printers that may be underutilized or may be candidates for redistribution or removal. Wherever possible, smaller printers will be replaced by fewer and larger printers to achieve savings in the use of energy and toner. This process will standardize printer models within the City to simplify the purchase of toner cartridges and allow for greater savings through bulk purchases.

Technology Renewal Plan
MIS aims to meet with each City department to jointly develop a technology renewal plan for that department's general office IT equipment (computers, printers, and so on) as well as any more specialized equipment (servers, storage, and so on) that the department currently uses or may need in the near future. The plan will contain an equipment replacement schedule, and, depending on the department's needs, will identify what should be replaced by new equipment and what may be replaced from available recycled inventory. The plan will also include opportunities to consolidate resources, to reduce electronic waste, reclaim physical space, and conserve energy.

TECHNOLOGY OPERATIONS

IT efficiency requires not only proper procurement, but proper operation. The following sections describe ways to maximize efficiency.

Power Management
Most new technology equipment now includes power-management capabilities that allow the equipment, when not in active use, to enter a state of lower energy consumption—for example, a "sleep mode"—without shutting completely off. Computer monitors in City Hall, in general, enter sleep mode after 20 minutes of inactivity. Some equipment has multiple such levels—for example, "sleep mode" and "hibernation mode." Although equipment requires energy to move from sleep mode to active mode, in many machines, the break-even point—that is, the length of time after which the energy saved in sleep mode exceeds the extra energy needed to return to active mode—can be reached in as little as 10 or 15 seconds; the newest equipment "wakes up" very quickly.

Settings that specify how soon equipment goes into an energy-saving mode should be as short as possible without impeding the workflow of the office. Default factory settings are often longer than necessary; in most cases, these are easily changed. Office managers or individual users should check—and, if necessary, change—the settings of equipment when it is delivered and periodically review them. As more equipment, such as multifunctional printers, is added to the City's computer network, MIS may establish network protocols that maximize energy savings. For help in adjusting the power management settings for both individual and general office equipment, contact the MIS Help Desk.

To reduce energy usage and greenhouse gas emissions during non-work hours, MIS has deployed centralized energy management software (Surveyor by Verdiem), which operates on all computers on the network. In general, all desktops are powered off between 5:00 p.m. and 7:00 a.m. Individual users may delay the automatic turn-off to accommodate varying work needs. When necessary, users may work with MIS to establish a different turn-off time. MIS has a goal of extending this capability to all City facilities. The automatic turn-off currently does not apply to computer monitors.

Notwithstanding the automatic turn-off, all employees should turn off their computers and monitors when they leave for the day and not rely on the automated system. In addition, users are encouraged to turn off

computers and monitors when leaving for extended times, for example, for lunch or a meeting. Also, when using other equipment—copiers and printers, for example—equipped with "Energy Saver" or similar buttons or switches, employees should press those buttons when they finish their use of the equipment and no one is waiting, without relying on the automatic energy saver.

Data Center Consolidation and Optimization

There are currently many data centers of varying sizes supported by different departments and agencies throughout the City. Each data center consumes power and requires separate staff resources to manage its operations. Several efforts are underway to create fewer, greener data centers.

Virtualization

Virtualization is a process that allows many logically and operationally independent computers to exist on one physical machine. MIS has successfully applied virtualization to a number of the City's production servers. By reducing the number of machines, virtualization reduces the need for space, power, and cooling. Work is underway to expand and promote the use of virtualization across the City, and may be considered as part of a department's technology renewal plan.

Storage

To optimize the use of data storage facilities across the City, MIS is developing an enterprise (City-wide) storage solution. This includes centralized purchase and location of data storage units, and continued exploration of new storage methods, such as storage virtualization.

Physical Consolidation

Virtualization and centralized storage, together with other efficiency measures, will facilitate the physical consolidation of the City's data centers into fewer, smaller, and more efficient centers. MIS is working with City departments and agencies to plan this consolidation, which will produce savings in electrical and cooling requirements, and simpler and more flexible data center management.

Thin Clients

MIS will continue to investigate opportunities to apply proven technologies such as thin clients to reduce the physical footprint of desktops. Thin clients are much smaller computers that rely on central servers for applications and data storage. Similar to server virtualization, thin client technology reduces energy consumption, greenhouse gas emission, and electronic waste. It is easier to manage and is lower in cost than full desktop PCs.

Printing and Document Management

Without restricting the ability of City of Boston employees to produce all the printed documents needed for municipal business, the Mayor's executive order establishes a goal of reducing consumption of paper. There are four primary ways to do this: reduce the amount of paper needed for a given document, reduce the number of documents printed, replace paper forms with electronic forms, and create online collaborative workspace.

Reducing Paper per Document

Double-sided printing will be set as default for printers that have duplex printing capability. The MIS Help Desk is available to assist office managers and individual users with this task. When necessary, employees can override the default to print single-sided.

Within City Hall, MIS has also reduced the default side margins on Word documents to 0.7 inch from 1.0 inch. Again, this default may be overridden to satisfy business needs. Employees may make the side margins even smaller for draft or internal documents.

Reducing the Number of Printed Documents
In the long run, reducing the number of printed documents might achieve even greater reductions than reducing paper per document. To the extent possible, employees should read documents received electronically on their computers. (To reduce the amount of paper that other people and organizations use, employees should replace subscriptions for printed newsletters and reports with electronic subscriptions.) Similarly, printed documents that need to be distributed should be scanned into a PDF file and distributed by e-mail, rather than copied or faxed.

Another significant source of unnecessary printing is the production of storage copies. The City has made significant efforts to create a reliable, secure computer network and data storage system. Electronic files stored on the City's network drives are backed up daily and provide as much, if not more, security as a paper copy in a file drawer. The MIS Help Desk can assist computer users unsure of the best methods for storing and backing up computer files. Departments may also want to review their policies and legal requirements—and, if necessary, consult the Law Department—concerning the storage of records and to develop their own document storage protocols.

Replacing Paper Forms with Electronic Forms
In an effort to reduce paper and streamline business processes, the City will continue its pursuit of forms automation. As internal examples of this pursuit, The Hub with Employee Self-Service and the online career center have begun to see paper reductions. Many of the employee information updates and submissions are made online, thus reducing, and in some cases, eliminating the use of paper forms.

Some tools, such as Liquid Office, that can convert print forms to Web-accessible forms, are already available from MIS. Departments should start to develop plans to convert paper forms into electronic forms. MIS is available for consultation in planning the conversion, which may be included as part of the technology renewal plan.

Creating Online Collaborative Workspace
MIS is positioned to assist departments in creating online collaborative workspaces where participants may post and share documents electronically. Benefits include reduction in paper distribution, versioning control, and centralized storage of documents.

Printer/Copier Supplies: Toner and Paper
Not strictly an IT issue, paper and toner are a significant operating expense for the City and are the end products of manufacturing processes requiring a lot of energy and other natural resources. As described in the EPP Guidelines, the City is committed to using paper with a high recycled content. Acceptable printers include only printers capable of using recycled paper and recycled toner cartridges. Any department that is not satisfied with the quality of documents from recycled materials should consult with the Purchasing and MIS departments.

MIS and the Purchasing Department are working together to reduce the number of different types of toner cartridges that the City has to acquire and to reduce the actual number of cartridges on hand at any one time. Excess cartridges represent money needlessly tied up, take up storage space, and are at risk of going to waste, if the printer that uses them reaches the end of its life. No department should have more than one extra toner cartridge for each printer. Efforts will be made to standardize printers and printer supplies

throughout the City. A standardization of printers and cartridges will make it easier for the Purchasing Department to ensure that sufficient inventory is always available. This will also simplify efforts to ensure recycling of all cartridges.

Operational Efficiency

Although the proper use of IT equipment can conserve energy and resources, even greater benefits can come from the creative use of IT in municipal operations.

Mobile Technology

MIS will identify and pursue opportunities for City employees to utilize mobile technology. Mobile technology can be deployed in many areas of service delivery in an effort to capture data in the field and eliminate the need for repeated travel back to a work location. Mobile technology is already being used in several departments for inspections and to issue violations.

GIS

MIS will continue to promote Geographic Information Systems (GIS) technology to all departments. GIS can be used to manage location-based activities to reduce vehicle energy consumption and, perhaps even more important, to identify patterns in activities or conditions that can be addressed more efficiently and effectively by City policies and services. GIS should be employed in all applications that have a location component.

End of life

As emphasized in the Mayor's executive order, the City has a general goal of reducing its waste stream and increasing recycling as much as possible. The City's EPP Guidelines favor products with a minimum of toxic materials, and the EPEAT standards include an evaluation of toxic material in IT equipment. Nonetheless, the complete elimination of hazardous substances in IT waste is not imminent, which means that its proper disposal is particularly important.

In some cases, providers of new IT equipment may be willing to take back old equipment. Otherwise, the City has a contractor who will recycle or properly dispose of IT equipment. All IT equipment no longer in use must be returned to MIS for recycling or proper disposal. If any department is unsure where to take it or needs help in moving it, contact the MIS Help Desk.

SUMMARY

This roadmap sets the benchmark for building a sustainable information technology infrastructure throughout the City. MIS and the Purchasing Department are ready and willing to work with City departments in evaluating their existing equipment, and in applying new and greener technologies. MIS will review and revise the roadmap periodically to reflect any updates in green IT standards and any development in applications of green IT.

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